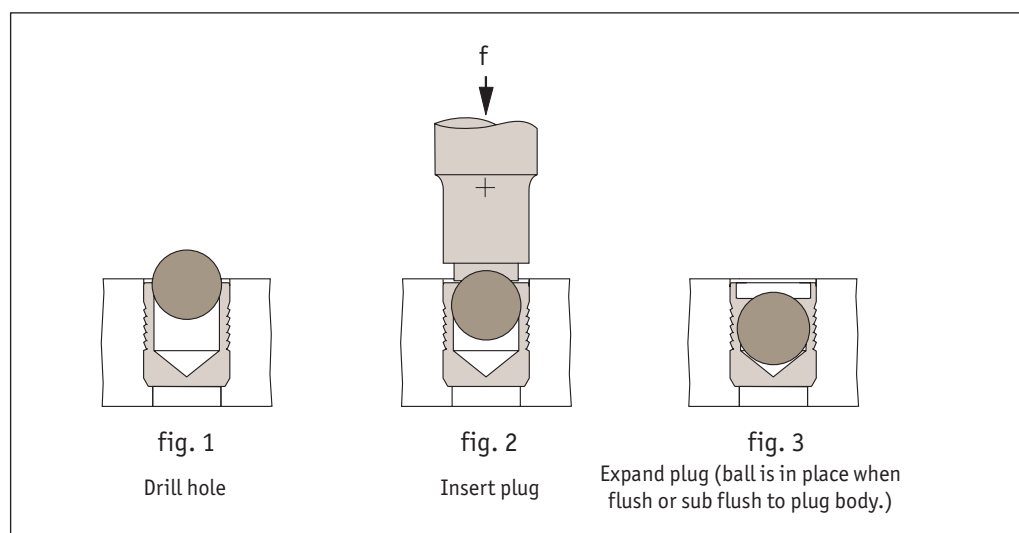




Hydraulic and pneumatic components and systems are often cross-drilled to provide the correct channels for air and gas. Some of these channels have to be drilled from the outside and later need to be closed off (plugged).

The expansion sealing plugs are inserted into a drilled hole and the expander ball is driven into the plug sleeve. The independent grooved sealing rings on the plug ball are driven into the housing material to permanently plug and seal the hole. The ball is retained in place.

No need for tapping or reaming, no machining of O ring grooves or the use of tapes or sealants. To seal a hole, follow this procedure:



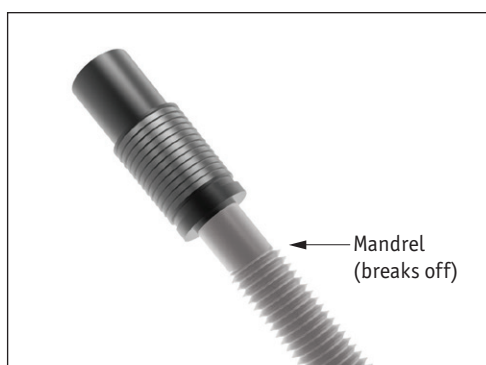
Applications

Some of the typical applications for our sealing screws include:

- Pneumatics
- Hydraulics
- Fluid Power
- Automation
- Industrial
- Aerospace
- Valves
- Regulators
- Cylinders



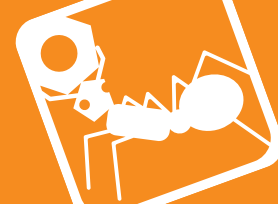
"Standard" Expansion sealing plugs - push the ball which expands the sleeve and seals the channel.



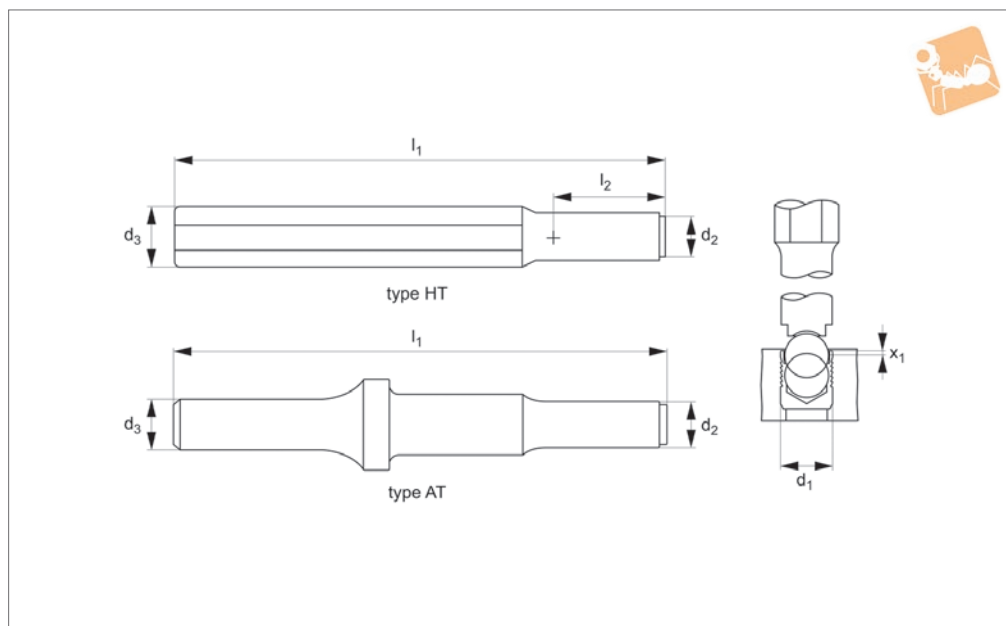
"Pull" Expansion sealing plugs. Pulling on the mandrel expands the sleeve, sealing the channel. At a predetermined force the mandrel breaks off.

Sealing Plugs from Automotion Components

BLANKING PLUGS



P0193



Material

Tool steel, heat-treated.

Technical Notes

Please consult technical pages for installa-

tion instructions and performance data.

Hand tool version and air tool (for multiple installations).

Ensure the ball is fully seated before

applying pressure.

Tips

Metric dimensions in mm.

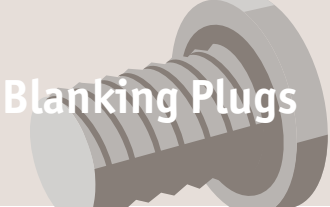
Inch dimensions in inches.

Order No.	d ₁	d ₂	d ₃	l ₁	l ₂	x ±0.2	Type
P0193.030-HT	3.0	2.8	9.53	127	10	0.4	Hand
P0193.040-HT	4.0	3.8	9.53	127	10	0.2	Hand
P0193.050-HT	5.0	4.7	9.53	127	12	0.4	Hand
P0193.060-HT	6.0	5.8	9.53	127	15	0.4	Hand
P0193.070-HT	7.0	6.8	9.53	127	18	0.4	Hand
P0193.080-HT	8.0	7.8	9.53	127	20	0.3	Hand
P0193.090-HT	9.0	8.7	15.88	127	22	0.4	Hand
P0193.100-HT	10.0	9.8	15.88	127	25	0.4	Hand
P0193.120-HT	12.0	11.7	15.88	127	30	0.4	Hand
P0193.140-HT	14.0	13.7	19.05	127	35	0.4	Hand
P0193.160-HT	16.0	15.7	19.05	127	40	0.6	Hand
P0193.180-HT	18.0	17.7	19.05	127	45	0.6	Hand
P0193.200-HT	20.0	19.7	25.40	127	50	0.8	Hand
P0193.220-HT	22.0	21.7	25.40	127	55	0.8	Hand
P0193.093-HT	0,093"	0,082"	0,394"	3,94"	0,137"	0,010"	Hand
P0193.125-HT	0,125"	0,117"	0,394"	3,94"	0,137"	0,010"	Hand
P0193.156-HT	0,156"	0,148"	0,394"	3,94"	0,137"	0,010"	Hand
P0193.187-HT	0,187"	0,180"	0,394"	3,94"	0,137"	0,010"	Hand
P0193.218-HT	0,218"	0,211"	0,394"	3,94"	0,400"	0,010"	Hand
P0193.250-HT	0,250"	0,242"	0,394"	3,94"	0,400"	0,010"	Hand
P0193.281-HT	0,281"	0,273"	0,394"	3,94"	0,400"	0,010"	Hand
P0193.030-AT	3.0	2.8	10.19	100	0.4	0.4	Air
P0193.040-AT	4.0	3.8	10.19	100	0.2	0.2	Air
P0193.050-AT	5.0	4.7	10.19	100	0.4	0.4	Air
P0193.060-AT	6.0	5.8	10.19	100	0.4	0.4	Air
P0193.070-AT	7.0	6.8	10.19	100	0.4	0.4	Air
P0193.080-AT	8.0	7.8	10.19	100	0.3	0.3	Air
P0193.090-AT	9.0	8.7	10.19	100	0.4	0.4	Air
P0193.100-AT	10.0	9.8	10.19	100	0.4	0.4	Air
P0193.120-AT	12.0	11.7	10.19	100	0.4	0.4	Air
P0193.140-AT	14.0	13.7	10.19	100	0.4	0.4	Air
P0193.160-AT	16.0	15.7	10.19	100	0.6	0.6	Air
P0193.180-AT	18.0	17.7	10.19	100	0.6	0.6	Air
P0193.200-AT	20.0	19.7	10.19	100	0.8	0.8	Air



Setting Tool for Sealing Plugs

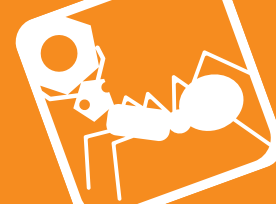
for expansion plugs



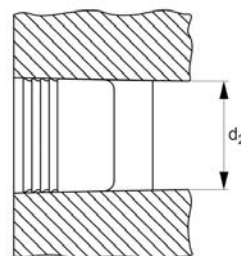
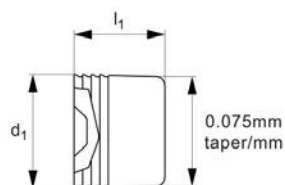
Blanking Plugs

Order No.	d ₁	d ₂	d ₃	l ₁	l ₂	x ±0.2	Type
P0193.220-AT	22.0	21.7	10.19	100	0.8	0.8	Air

BLANKING PLUGS



P0194



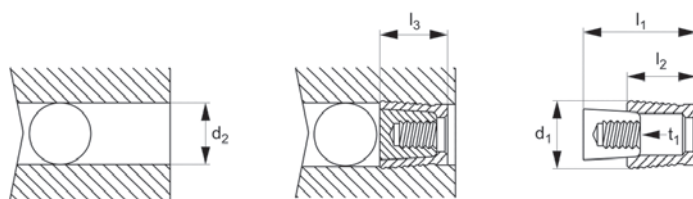
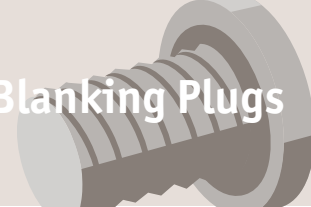
Material
Aluminium (6061).

a 0.075mm/mm taper over their length.
Burst pressure 35 bar (500 psi).

Technical Notes

These are high pressure sealing plugs with

Order No.	d ₁	d ₂ max.	l ₁	Size
P0194.070	7.01	6.50	5.5	7
P0194.090	9.01	8.38	5.5	9
P0194.110	11.03	10.39	5.5	11
P0194.130	13.03	12.40	5.5	13
P0194.160	16.08	15.39	5.5	16



P0195

BLANKING PLUGS

Material

Sleeve: case-hardened steel, black oxide finish.

Pin: heat-treatable steel, black oxide finish.

to blank off externally drilled holes for air and gas.

No need for tapping, reaming, machining of O-ring grooves or the use of tapes or sealants.

product installation details.

Technical Notes

These high pressure sealing plugs are used

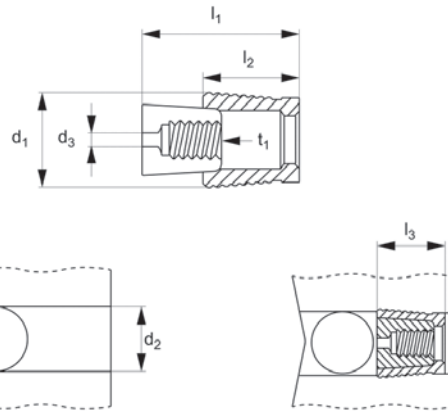
Important Notes

Please refer to technical pages for

Order No.	d_1	d_2 +0.1/-0.0	l_1	l_2	l_3	t_1
P0195.070	7.0	7.0	13.0	7.5	8.0	4-40 UNC
P0195.080	8.0	8.0	14.0	8.5	9.0	6-32 UNC
P0195.090	9.0	9.0	16.0	9.5	10.0	8-32 UNC
P0195.100	10.0	10.0	18.0	10.5	11.0	10-32 UNC
P0195.120	12.0	12.0	21.0	12.5	13.0	10-32 UNC
P0195.140	14.0	14.0	25.0	14.5	15.0	1/4-20 UNC
P0195.160	16.0	16.0	28.0	16.5	17.0	1/4-20 UNC
P0195.180	18.0	18.0	31.5	18.5	19.0	5/16-18 UNC
P0195.200	20.0	20.0	35.0	20.5	21.0	3/8-16 UNC
P0195.220	22.0	22.0	38.5	22.5	23.0	3/8-16 UNC



P0196



Material

Sleeve: case-hardened steel, black oxide finish.

Pin: heat-treatable steel, black oxide finish.

Technical Notes

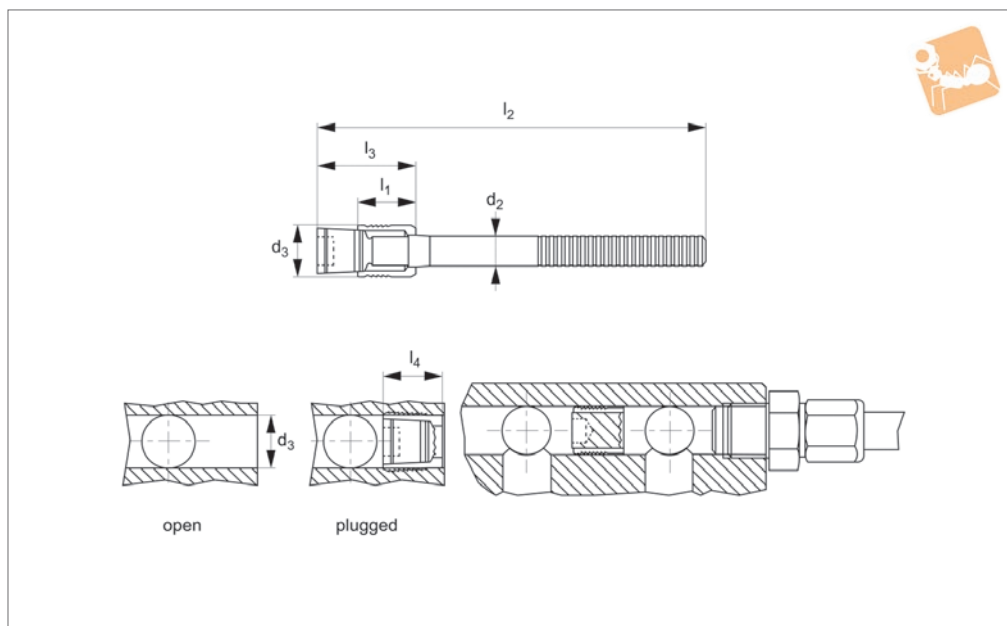
Select the bore size and d_3 required (in inches).

eg. P0196.070-030 is a 7mm pull plug restrictor with 0.030" orifice.

Important Notes

Please refer to technical pages for product installation details.

Order No.	d_1	d_2 +0.1 -0.0	d_3 inch	l_1	l_2	l_3	t_1
P0196.070-xxx	7.0	7.0	0,012-0,13	13.0	7.5	8.0	4-40 UNC
P0196.080-xxx	8.0	8.0	0,012-0,15	14.0	8.5	9.0	6-32 UNC
P0196.090-xxx	9.0	9.0	0,012-0,17	16.0	9.5	10.0	8-32 UNC
P0196.100-xxx	10.0	10.0	0,012-0,20	18.0	10.5	11.0	10-32 UNC
P0196.120-xxx	12.0	12.0	0,012-0,24	21.0	12.5	13.0	10-32 UNC
P0196.140-xxx	14.0	14.0	0,12-0,28	25.0	14.5	15.0	1/4-20 UNC
P0196.160-xxx	16.0	16.0	0,012-0,30	28.0	16.5	17.0	1/4-20 UNC
P0196.180-xxx	18.0	18.0	0,012-0,35	31.5	18.5	19.0	5/16-18 UNC
P0196.200-xxx	20.0	20.0	0,012-0,40	35.0	20.5	21.0	3/8-16 UNC
P0196.220-xxx	22.0	22.0	0,012-0,43	38.5	22.5	23.0	3/8-16 UNC



P0197

BLANKING PLUGS

Material

Sleeve: case-hardened steel, black oxide finish.

Mandrel: heat-treated steel, black oxide finish.

Technical Notes

These high pressure sealing plugs are used to blank off externally drilled holes for air and gas.

No need for tapping, reaming, machining

of O-ring grooves or the use of tapes or sealants.

Short version - with short mandrel.

Long version - with long mandrel.

Tips

Working pressure up to 450 bar (dependent on body material and material into which installed).

Pulling on the mandrel forces the plug insert into the plug body, expanding the

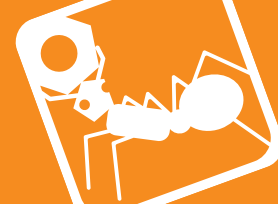
body out to grip on the channel walls.

At a set pressure the mandrel then breaks off and is removed with the plug remaining firmly set inside the bore.

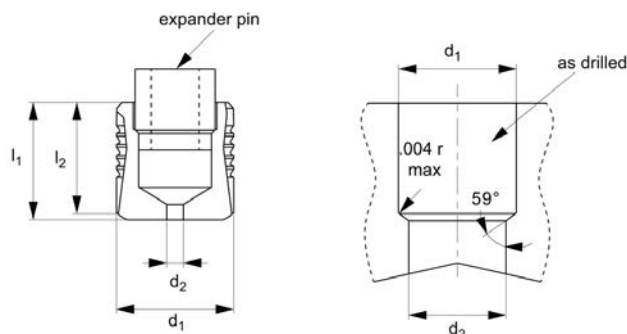
Important Notes

Please refer to technical pages for product installation details.

Order No.	d ₁	d ₂	d ₃ +0.12 -0.0	l ₁	l ₂	l ₃ max.	l ₄ max.	Type
P0197.040-S	4.0	2.50	4.0	4.0	39	9.0	6.5	Short
P0197.050-S	5.0	3.00	5.0	5.5	41	10.0	7.5	Short
P0197.060-S	6.0	3.40	6.0	6.5	43	12.0	8.0	Short
P0197.070-S	7.0	4.10	7.0	7.5	38	14.0	9.0	Short
P0197.080-S	8.0	4.20	8.0	8.5	40	15.0	10.5	Short
P0197.090-S	9.0	4.50	9.0	9.5	43	17.0	11.0	Short



P0198



Material

A2 Stainless steel.

Calibrated hole diameter (d_2).

Technical Notes

For restricting flow.

Select size required then add -xxx which

indicated reduced hole diameter (d_2), eg
P0198.090-015 indicated a 9mm bore size
with a 0.015" orifice.

Tips

Metric dimensions in mm.

Imperial dimensions in inches. (Length

Tolerance $\pm 0,006$)

Important Notes

Please refer to technical pages for
product installation details.

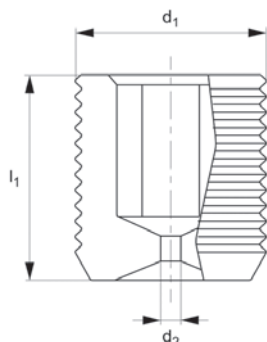
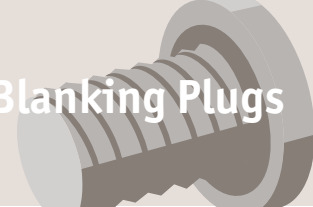
Order No.	d_1 +0	d_2 ± 0.001	d_3 ± 0.010	d_4 max.	l_1 ± 0.010	l_2 ± 0.010	l_3 min.
P0198.040-XXX	4,00 -0,030	0,012-0,015"	4,00	3,3	4,0	3,7	3,8
P0198.050-xxx	5,00 -0,030	0,012-0,075"	5,00	4,3	5,0	5,2	5,3
P0198.060-XXX	6,00 -0,030	0,012-0,100"	6,00	5,3	6,0	6,2	6,3
P0198.070-XXX	7,00 -0,036	0,012-0,130"	7,00	6,2	7,0	7,2	7,3
P0198.080-XXX	8,00 -0,036	0,012-0,150"	8,00	7,2	8,0	8,2	8,3
P0198.090-xxx	9,00 -0,036	0,012-0,170"	9,00	8,2	9,0	9,70	9,8
P0198.100-xxx	10,00 -0,036	0,012-0,195"	10,00	9,2	10,0	10,70	10,8
P0198.120-xxx	12,00 -0,043	0,012-0,240"	12,00	11,0	12,0	12,70	12,8
P0198.140-XXX	14,00 -0,043	0,012-0,280"	14,00	13,0	14,0	14,40	14,5
P0198i.156-xxx	0,1562 -0,0012"	0,012-0,050"	0,1562"	0,130"	0,161"	0,149"	0,149"
P0198i.187-xxx	0,1875 -0,0012"	0,012-0,070"	0,1875"	0,160"	0,220"	0,208"	0,208"
P0198i.218-xxx	0,2187 -0,0012"	0,012-0,085"	0,2187"	0,190"	0,220"	0,208"	0,208"
P0198i.250-xxx	0,2500 -0,0012"	0,012-0,105"	0,2500"	0,220"	0,259"	0,247"	0,247"
P0198i.281-xxx	0,2817 -0,0014"	0,012-0,130"	0,2812"	0,250"	0,299"	0,287"	0,287"
P0198i.312-xxx	0,3125 -0,0014"	0,012-0,150"	0,3125"	0,281"	0,338"	0,326"	0,326"
P0198i.343-xxx	0,3437 -0,0014"	0,012-0,160"	0,3437"	0,312"	0,397"	0,385"	0,385"
P0198i.375-xxx	0,3750 -0,0014"	0,012-0,180"	0,3750"	0,343"	0,397"	0,385"	0,385"
P0198i.406-xxx	0,4062 -0,0014"	0,012-0,195"	0,4062"	0,375"	0,437"	0,425"	0,425"
P0198i.437-xxx	0,4375 -0,0014"	0,012-0,220"	0,4375"	0,406"	0,515"	0,503"	0,503"
P0198i.468-xxx	0,4687 -0,0017"	0,012-0,240"	0,4687"	0,437"	0,515"	0,503"	0,503"
P0198i.562-xxx	0,5625 -0,0017"	0,012-0,290"	0,5625"	0,510"	0,594"	0,570"	0,570"



Metric Threaded Restrictors

Stainless Steel

Blanking Plugs



P0199

BLANKING PLUGS

Material

A2 stainless steel

Technical Notes

For restricting flow.

Select size required then add -xxx which indicated reduced hole diameter (d_2), eg P0199.080-0150 A2 indicated a 8mm bore size with a 0.38 orifice.

Important Notes

Please refer to technical pages for product installation details.

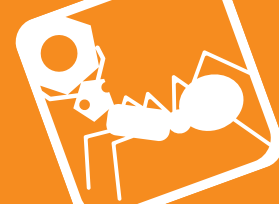
Order No.	d_1	d_1 nom.	d_2	l_1	A/F
P0199.040-003-A2	M 4x0,7	4	0.30	4	2
P0199.040-004-A2	M 4x0,7	4	0.38	4	2
P0199.040-005-A2	M 4x0,7	4	0.51	4	2
P0199.040-006-A2	M 4x0,7	4	0.61	4	2
P0199.040-007-A2	M 4x0,7	4	0.71	4	2
P0199.040-008-A2	M 4x0,7	4	0.81	4	2
P0199.040-009-A2	M 4x0,7	4	0.89	4	2
P0199.050-003-A2	M 5x0,8	5	0.30	5	2.5
P0199.050-004-A2	M 5x0,8	5	0.38	5	2.5
P0199.050-005-A2	M 5x0,8	5	0.51	5	2.5
P0199.050-006-A2	M 5x0,8	5	0.61	5	2.5
P0199.050-007-A2	M 5x0,8	5	0.71	5	2.5
P0199.050-008-A2	M 5x0,8	5	0.81	5	2.5
P0199.050-009-A2	M 5x0,8	5	0.89	5	2.5
P0199.050-010-A2	M 5x0,8	5	1.02	5	2.5
P0199.050-011-A2	M 5x0,8	5	1.12	5	2.5
P0199.050-012-A2	M 5x0,8	5	1.22	5	2.5
P0199.050-013-A2	M 5x0,8	5	1.27	5	2.5
P0199.050-014-A2	M 5x0,8	5	1.40	5	2.5
P0199.060-003-A2	M 6x1,0	6	0.30	6	3
P0199.060-004-A2	M 6x1,0	6	0.38	6	3
P0199.060-005-A2	M 6x1,0	6	0.51	6	3
P0199.060-006-A2	M 6x1,0	6	0.61	6	3
P0199.060-007-A2	M 6x1,0	6	0.71	6	3
P0199.060-008-A2	M 6x1,0	6	0.81	6	3
P0199.060-009-A2	M 6x1,0	6	0.89	6	3
P0199.060-010-A2	M 6x1,0	6	1.02	6	3
P0199.060-011-A2	M 6x1,0	6	1.12	6	3
P0199.060-012-A2	M 6x1,0	6	1.22	6	3
P0199.060-013-A2	M 6x1,0	6	1.27	6	3
P0199.060-014-A2	M 6x1,0	6	1.40	6	3
P0199.060-015-A2	M 6x1,0	6	1.50	6	3
P0199.060-016-A2	M 6x1,0	6	1.60	6	3
P0199.060-017-A2	M 6x1,0	6	1.70	6	3



Automotion
AN ESSENTA COMPANY

0333 207 4498

sales@automotioncomponents.co.uk



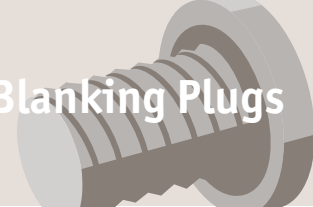
Order No.	d ₁	d ₁ nom.	d ₂	l ₁	A/F
P0199.060-018-A2	M 6x1,0	6	1.80	6	3
P0199.060-019-A2	M 6x1,0	6	1.91	6	3
P0199.080-003-A2	M 8x1,25	8	0.30	8	4
P0199.080-004-A2	M 8x1,25	8	0.38	8	4
P0199.080-005-A2	M 8x1,25	8	0.51	8	4
P0199.080-006-A2	M 8x1,25	8	0.61	8	4
P0199.080-007-A2	M 8x1,25	8	0.71	8	4
P0199.080-008-A2	M 8x1,25	8	0.81	8	4
P0199.080-009-A2	M 8x1,25	8	0.89	8	4
P0199.080-010-A2	M 8x1,25	8	1.02	8	4
P0199.080-011-A2	M 8x1,25	8	1.12	8	4
P0199.080-012-A2	M 8x1,25	8	1.22	8	4
P0199.080-013-A2	M 8x1,25	8	1.27	8	4
P0199.080-014-A2	M 8x1,25	8	1.40	8	4
P0199.080-015-A2	M 8x1,25	8	1.50	8	4
P0199.080-016-A2	M 8x1,25	8	1.60	8	4
P0199.080-017-A2	M 8x1,25	8	1.70	8	4
P0199.080-018-A2	M 8x1,25	8	1.80	8	4
P0199.080-019-A2	M 8x1,25	8	1.91	8	4
P0199.080-020-A2	M 8x1,25	8	1.98	8	4
P0199.080-021-A2	M 8x1,25	8	2.08	8	4
P0199.080-022-A2	M 8x1,25	8	2.16	8	4
P0199.080-023-A2	M 8x1,25	8	2.29	8	4
P0199.080-024-A2	M 8x1,25	8	2.41	8	4
P0199.080-025-A2	M 8x1,25	8	2.54	8	4
P0199.080-026-A2	M 8x1,25	8	2.59	8	4
P0199.080-027-A2	M 8x1,25	8	2.69	8	4
P0199.080-028-A2	M 8x1,25	8	2.79	8	4
P0199.080-029-A2	M 8x1,25	8	2.92	8	4
P0199.100-003-A2	M10x1,5	10	0.30	10	5
P0199.100-004-A2	M10x1,5	10	0.38	10	5
P0199.100-005-A2	M10x1,5	10	0.51	10	5
P0199.100-006-A2	M10x1,5	10	0.61	10	5
P0199.100-007-A2	M10x1,5	10	0.71	10	5
P0199.100-008-A2	M10x1,5	10	0.81	10	5
P0199.100-009-A2	M10x1,5	10	0.89	10	5
P0199.100-010-A2	M10x1,5	10	1.02	10	5
P0199.100-011-A2	M10x1,5	10	1.12	10	5
P0199.100-012-A2	M10x1,5	10	1.22	10	5
P0199.100-013-A2	M10x1,5	10	1.27	10	5
P0199.100-014-A2	M10x1,5	10	1.40	10	5
P0199.100-015-A2	M10x1,5	10	1.50	10	5
P0199.100-016-A2	M10x1,5	10	1.60	10	5
P0199.100-017-A2	M10x1,5	10	1.70	10	5
P0199.100-018-A2	M10x1,5	10	1.80	10	5
P0199.100-019-A2	M10x1,5	10	1.91	10	5
P0199.100-020-A2	M10x1,5	10	1.98	10	5
P0199.100-021-A2	M10x1,5	10	2.08	10	5
P0199.100-022-A2	M10x1,5	10	2.16	10	5
P0199.100-023-A2	M10x1,5	10	2.29	10	5
P0199.100-024-A2	M10x1,5	10	2.41	10	5
P0199.100-025-A2	M10x1,5	10	2.54	10	5
P0199.100-026-A2	M10x1,5	10	2.59	10	5
P0199.100-027-A2	M10x1,5	10	2.69	10	5
P0199.100-028-A2	M10x1,5	10	2.79	10	5
P0199.100-029-A2	M10x1,5	10	2.92	10	5
P0199.100-030-A2	M10x1,5	10	3.00	10	5
P0199.100-031-A2	M10x1,5	10	3.10	10	5
P0199.100-032-A2	M10x1,5	10	3.18	10	5
P0199.100-033-A2	M10x1,5	10	3.30	10	5
P0199.100-034-A2	M10x1,5	10	3.43	10	5
P0199.100-035-A2	M10x1,5	10	3.51	10	5
P0199.100-036-A2	M10x1,5	10	3.58	10	5
P0199.100-037-A2	M10x1,5	10	3.68	10	5
P0199.100-038-A2	M10x1,5	10	3.81	10	5
P0199.100-039-A2	M10x1,5	10	3.91	10	5
P0199.120-003-A2	M12x1,75	12	0.30	12	6
P0199.120-004-A2	M12x1,75	12	0.38	12	6



Metric Threaded Restrictors

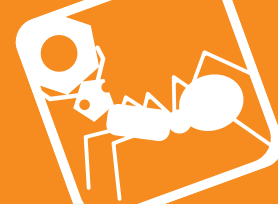
Stainless Steel

Blanking Plugs



Order No.	d ₁	d ₁ nom.	d ₂	l ₁	A/F
P0199.120-005-A2	M12x1,75	12	0.51	12	6
P0199.120-006-A2	M12x1,75	12	0.61	12	6
P0199.120-007-A2	M12x1,75	12	0.71	12	6
P0199.120-008-A2	M12x1,75	12	0.81	12	6
P0199.120-009-A2	M12x1,75	12	0.89	12	6
P0199.120-010-A2	M12x1,75	12	1.02	12	6
P0199.120-011-A2	M12x1,75	12	1.12	12	6
P0199.120-012-A2	M12x1,75	12	1.22	12	6
P0199.120-013-A2	M12x1,75	12	1.27	12	6
P0199.120-014-A2	M12x1,75	12	1.40	12	6
P0199.120-015-A2	M12x1,75	12	1.50	12	6
P0199.120-016-A2	M12x1,75	12	1.60	12	6
P0199.120-017-A2	M12x1,75	12	1.70	12	6
P0199.120-018-A2	M12x1,75	12	1.80	12	6
P0199.120-019-A2	M12x1,75	12	1.91	12	6
P0199.120-020-A2	M12x1,75	12	1.98	12	6
P0199.120-021-A2	M12x1,75	12	2.08	12	6
P0199.120-022-A2	M12x1,75	12	2.16	12	6
P0199.120-023-A2	M12x1,75	12	2.29	12	6
P0199.120-024-A2	M12x1,75	12	2.41	12	6
P0199.120-025-A2	M12x1,75	12	2.54	12	6
P0199.120-026-A2	M12x1,75	12	2.59	12	6
P0199.120-027-A2	M12x1,75	12	2.69	12	6
P0199.120-028-A2	M12x1,75	12	2.79	12	6
P0199.120-029-A2	M12x1,75	12	2.92	12	6
P0199.120-030-A2	M12x1,75	12	3.00	12	6
P0199.120-031-A2	M12x1,75	12	3.10	12	6
P0199.120-032-A2	M12x1,75	12	3.18	12	6
P0199.120-033-A2	M12x1,75	12	3.30	12	6
P0199.120-034-A2	M12x1,75	12	3.43	12	6
P0199.120-035-A2	M12x1,75	12	3.51	12	6
P0199.120-036-A2	M12x1,75	12	3.58	12	6
P0199.120-037-A2	M12x1,75	12	3.68	12	6
P0199.120-038-A2	M12x1,75	12	3.81	12	6
P0199.120-039-A2	M12x1,75	12	3.91	12	6
P0199.120-040-A2	M12x1,75	12	4.01	12	6
P0199.120-041-A2	M12x1,75	12	4.11	12	6
P0199.120-042-A2	M12x1,75	12	4.19	12	6
P0199.120-043-A2	M12x1,75	12	4.32	12	6
P0199.120-044-A2	M12x1,75	12	4.42	12	6
P0199.120-045-A2	M12x1,75	12	4.50	12	6
P0199.120-046-A2	M12x1,75	12	4.60	12	6
P0199.120-047-A2	M12x1,75	12	4.70	12	6
P0199.120-048-A2	M12x1,75	12	4.83	12	6
P0199.120-049-A2	M12x1,75	12	4.90	12	6
P0199.120-050-A2	M12x1,75	12	4.95	12	6

BLANKING PLUGS



Hole Preparation

Refer to the data sheet for the correct hole size to drill for the counterbored and drilled hole size and tolerance. Hole concentricity must be held within 0,05mm.

Bore roughness must be between Rz (RMS) 10-30μ (especially for hard materials).

Avoid spiral or longitudinal grooves as these may affect plug performance. Ensure the holes are clean and dirt free.

Installation

Insert the plug into the counterbored hole with the ball facing outwards, seated against the counterbore shoulder.

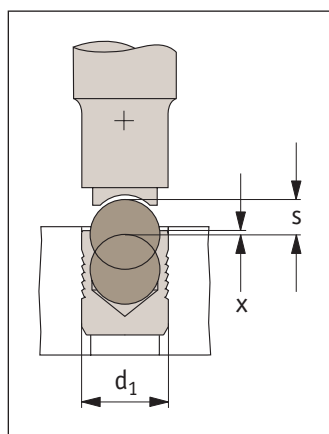
Press the ball into the sleeve so that the top of the ball is slightly below the top of the sleeve (note approximate values for x and s in table below):

d_1	3	4	5	6	7	8	9	10	12	14	16	18	20	22
Stroke - s	1.2	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.5	6.35	7.0	8.0	9.0	10.0
Top of ball relative to top of sleeve - x ± 0.2	0.4	0.2	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.6	0.6	0.8	0.8

Use the correct installation tool for each plug size. The plugs can be installed using a hammer and the installation tool. An air hammer with the correct air hammer installation tool can also be used.

Minimum wall thickness and distance from an edge

The radial expansion of the plug causes the housing material around the plug to deform plastically. Therefore a proper minimum wall thickness or distance from an edge is necessary to optimise the strength of the mechanical connection. The operating hydraulic pressure, thermal cycling, plug type and characteristics of the base metal also need to be considered – please consult our technical department.

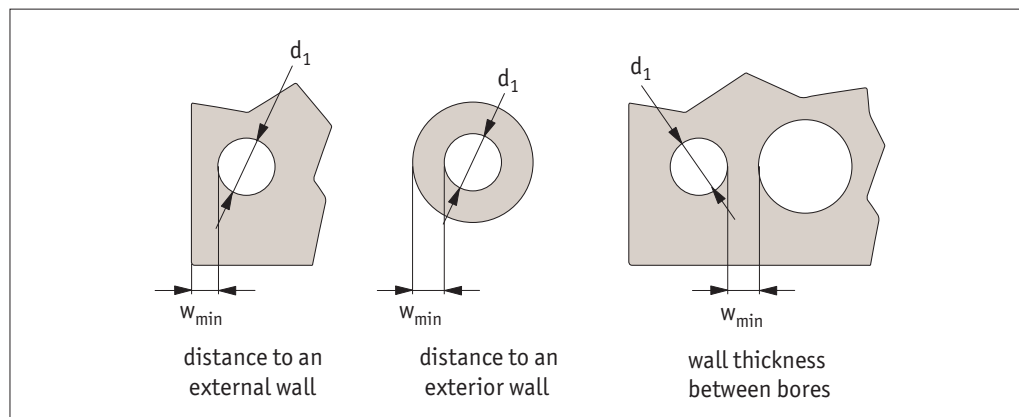


$$d_1 \geq 4\text{mm}$$

$$w_{\min} = f_{\min} \times d_1$$

$$d_1 < 4\text{mm}$$

$$w_{\min} = (f_{\min} \times d_1) + 0.5\text{mm}$$

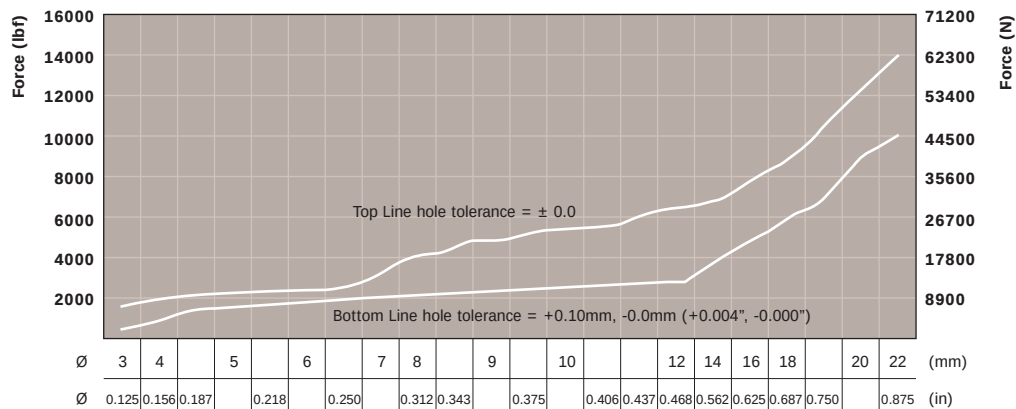


The guidelines for minimum wall thickness or distance from and edge ($W_{\min}$) are shown below – these minimum values produce only a very slight deformation on the exterior profile (less than 20 microns).

Sealing Plug type	Base Metal						
	Steel (SAE 1144)	Steel (SAE 10L15)	Cast Iron (ASTM A48)	Ductile Iron (ASTM A356)	Aluminium (2024- T4)	Aluminium (6061- T6)	Cast Aluminium (356-T6)
	Factor $f_{\min}$						
Steel body	0.5	0.6	1.0	0.6	0.6	1.0	1.0
Stainless Body	0.6	0.8	1.0	0.8	0.8	1.0	1.0
Pull PLUGs	0.5	0.6	1.0	0.6	0.6	1.0	1.0

Installation Forces Guidelines

The values offered are to be used as a guideline. The base metal chosen for your specific application, the surface treatment, hole size and surface finish all affect the seal performance. Please contact our Technical Department for more information.



Installation Forces:

Pressure Performance Guidelines

	Steel (Case-hardened) Plug Body	
	Ø 3-10	Ø 12-32
Steel (SAE 1144)	350 bar working pressure 1,100 bar proof pressure	380 bar working pressure 900 bar proof pressure
Steel (SAE 10L15)		
Cast Iron (ASTM A48)		
Ductile Iron (ASTM A356)		
Aluminium (2024-T4)		
Aluminium (6061-T6)	310 bar working pressure	240 bar working pressure
Cast Aluminium (356-T6)	1,000 bar proof pressure	800 bar proof pressure

	Stainless Steel (300 Series) Plug Body	
	Ø 3-10	Ø 12-32
Steel (SAE 1144)	450 bar working pressure 1,300 bar proof pressure	450 bar working pressure 1,100 bar proof pressure
Steel (SAE 10L15)		
Cast Iron (ASTM A48)		
Ductile Iron (ASTM A356)		
Aluminium (2024-T4)		
Aluminium (6061-T6)	380 bar working pressure	280 bar working pressure
Cast Aluminium (356-T6)	1,200 bar proof pressure	900 bar proof pressure

	Aluminium (2024-T4) Plug Body	
	Ø 3-10	Ø 12-32
Steel (SAE 1144)	450 bar working pressure 1,300 bar proof pressure	350 bar working pressure 1,100 bar proof pressure
Steel (SAE 10L15)		
Cast Iron (ASTM A48)		
Ductile Iron (ASTM A356)		
Aluminium (2024-T4)		
Aluminium (6061-T6)	380 bar working pressure	280 bar working pressure
Cast Aluminium (356-T6)	1,200 bar proof pressure	900 bar proof pressure